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Of those observers who reported being conscious of boredom, 34.6 per cent. showed higher affective values for the colors at the end of the series than for the same colors at the beginning, and 65 per cent. showed lower affective values. A difference of 30.4 per cent. represented the tendency of affective values to drop as the result of ennui. Of those observers who reported equal interest maintained throughout the experiment, 36 per cent. gave an average affective value higher for the colors on their second presentation, and 56 per cent. an average affective value lower for the colors on the second presentation: a difference of 20 per cent. indicating the observers who in spite of not recognizing boredom introspectively, showed a fall in the average degree of pleasantness assigned to the colors at the end of the series. Of the five observers who said they were more interested in the colors at the end than at the beginning, three showed a rise in the average affective values assigned to the colors and two a fall.

Turning to the coefficients of affective sensibility, we find that among the observers who reported ennui, 23 per cent. showed increased affective sensibility and 53 per cent. decreased affective sensibility, a difference of 20 per cent. in favor of the conclusion that ennui lowers the affective sensibility. Among the observers who reported equal interest throughout, 43 per cent. showed increased affective sensibility and 38 per cent. decreased affective sensibility. All of the five observers who said their interest increased showed increased affective sensibility.

These results indicate that, under the conditions of our experiments, affective sensibility to colors tends to diminish with ennui produced by a long series of judgments on the affective values of colors, and that diminution in affective sensibility is more closely correlated with introspective reports of ennui than is the average affective value of the colors. The percentages of observers who showed a lowering of the affective values of the colors were 65 for the observers who reported ennui, 56 for those who reported equal interest throughout, and 40 for the few who reported increased interest. The percentages of observers showing decreased affective sensibility were 53 for those reporting ennui, 38 for those reporting equal interest, and 0 for those reporting increased interest.

XXX. THE SOURCE OF AFFECTIVE REACTIONS TO ARTICULATE SOUNDS

By LOUISE N. GARVER, JOSEPHINE M. GLEASON, and M. F. WASHBURN

So far as we know, the first experimental investigation of the pleasantness and unpleasantness produced by articulate sounds was made in this laboratory, the results being published in this JOURNAL, volume 23, pp. 579-583. The object of this study was to find what consonants and what vowels are most agreeable and most disagreeable when used in nonsense syllables composed of an initial vowel and a final consonant. During the experiments made in the investigation the question naturally suggested itself as to why certain articulate sounds should be agreeable and others disagreeable. The present study is an attempt to answer this question.

The material was again nonsense syllables composed of an initial vowel and a final consonant. The vowel sounds used were a as in ate, a as in father, a as in hat, aw, ee, e as in wet, i as in life, i

as in hit, o as in ope, o as in hot, oo, u as in hut, ow, and oi. The consonants included the hard checks p, t, and k; the soft checks b, d, and g; the breaths f, v, th as in breath, th as in breathe, sh, zh, s, and z. Each syllable was pronounced clearly to the observer, who was asked to record her judgment of its pleasantness or unpleasantness by using the numbers 1 to 7, and after doing so to give from introspection the reasons which made the sound seem pleasant or unpleasant. The total number of syllables used with each observer was 151, all combinations making sense being excluded. The syllables were presented in the same order with each observer, so as to exclude the factor of affective contrast. The total number of observers was sixty-five. The great majority were, as usually in our studies, young women college students, but there were seven persons of greater maturity among the number, and also seven men, too small a number, of course, to permit of any comparison between groups.

Two sources at once suggest themselves for the affective reactions made to meaningless articulate sounds: the associative suggestions which the sounds have in spite of their meaningless character, and the ease or difficulty of the articulatory movements involved in pronouncing them. The first conclusion which we have been able to draw from a study of our results is that extreme judgments of pleasantness or unpleasantness, judgments of 'very pleasant' or 'very unpleasant,' are more apt to be due to associations than are judgments of moderate pleasantness or unpleasantness. The per cent. of 'very unpleasant' judgments due to associations with the nonsense syllables was 24; the per cent. of 'moderately unpleasant' judgments due to the same cause was 12.3; that of 'slightly unpleasant' judgments was 12.6; that of 'slightly pleasant' judgments was 13.4; that of 'moderately pleasant' judgments 16.4; that of 'very pleasant' judgments 20.9. We might conclude that there is little about the character of an articulate sound itself, aside from the associations it suggests, to give rise to extreme affective reactions.

The nature of the associations suggested by the sounds may be briefly summarized. First, there were many associations made directly with words, as when the sound 'ool' suggested 'pool.' Or the word association was indirectly made, as when 'ög' suggested 'fairy tale,' obviously through 'ogre.' Secondly, a sound often suggested the object making a similar sound: 'ees' suggested mice. Thirdly, a sound suggested that it was a corruption of a word through dialect or some defect of articulation. Fourthly, a sound sometimes suggested a sensation associated with a word meaning: 'ife' felt sharp, 'oother' felt like a hand stroking the shoulders; both clearly indirect word associations. Finally, there were a number of unaccountable associations with the sounds. 'Oig' suggested a sickly grin, 'ofe' a witch, 'oif' a giant, and so on. Very likely these were cases of 'mediate' verbal associations.

It appears, as a second conclusion, from the figures given above that associations contribute more to the pleasantness than to the unpleasantness of articulate sounds. The aggregate of the percentages of unpleasant judgments due to association was 48.9; that of the percentages of pleasant judgments due to association was 59.7.

A third conclusion is that the pleasantness or unpleasantness derived from ease or difficulty of articulation is more likely to be of a moderate than of an extreme character. 2.8 per cent. of the judgments 'very unpleasant' were due to the unpleasantness and difficulty of articulation; 3.7 per cent. of the 'moderately unpleasant' judgments,

5.5 per cent. of the 'slightly unpleasant' judgments. 4.2 per cent. of the 'slightly pleasant' judgments were assigned to ease and agreeableness of articulatory movements as a cause; 4 per cent. of the 'moderately pleasant' judgments, and 3.2 per cent. of the 'very pleasant' judgments. It will be noted, finally, that the balance here is a little on the side of unpleasantness; the percentage of judgments 'slightly unpleasant' is the largest due to articulatory influences.

The cases where no reason was given for finding a sound pleasant or unpleasant include two classes which we have not attempted to separate: those where the unpleasantness or pleasantness may really have belonged to the sound itself, and those where the observer's introspection was unequal to the task of detecting the reasons for her own reaction. It is a question which goes to the root of aesthetics, whether a sensation can have any affective character that does not trace its cause to welfare. Our likes and dislikes are traditionally explained as due to conditions that favor or hinder our own good, including that of our species. How can finding a color pleasant or unpleasant have survival value? We can connect articulate sounds with welfare through their associations and through the benefit of free movement of the articulatory mechanisms and the harm of impeded movements. The impossibility of distinguishing between the effects of imperfect introspection and those of affective reactions to pure sounds, aside from associative or kinaesthetic elements, makes us unable to draw any conclusions with regard to the occurrence of such reactions.

Certain observers reacted separately to the consonant and to the vowel in a syllable; that is, they declared that they liked or disliked both, or liked one and disliked the other. In this case the vowel sounds were nearly always declared to be simply agreeable or disagreeable, without further qualification. The consonants, on the other hand, often had some more definitely qualifying adjective applied to them. Occasionally these adjectives referred to an association suggested by the consonant itself, as 'lispings' for *th*. In other instances the adjectives were descriptive of the consonant sound itself. The checks, especially *p*, *b*, and *d*, were objected to as cutting short the vowel sound too abruptly, as being sudden. On the other hand *l*, *m*, and *th* as in *breathe* were especially commended for the opposite character of being 'continuous,' 'letting the sound out.' Does the dislike of an abrupt close to the vowel sound rest upon the general association of abrupt movements with violence and constraint? The term 'hard' or 'harsh' was commonly applied to the guttural checks, which are the most unpopular consonants. It is difficult to decide whether this refers more to the abrupt character of these modifications of sound, that is, depends upon a suggestion essentially kinaesthetic, of checked or impeded movement, or whether a real auditory harshness is felt. Certain breaths are criticized as hard to finish; *f* and *v*, for example: this is a kinaesthetic unpleasantness. *Sh*, *th*, and *zh* were often condemned as 'sloppy.' This is probably a sound association, a suggestion of the noises made by splashing liquid. That the vowel sounds should have no qualifying adjectives except 'pleasant' and 'unpleasant' is easily understood. There is much more of the purely auditory character and less of the kinaesthetic about a vowel than about a consonant. The long vowels are generally preferred to the short ones (although short *e* is a very popular vowel) because they are more musical; the tone quality has more time to be appreciated. Musical changes have an affective value in themselves that

it is difficult to trace to any associative source. Articulatory movements, on the other hand, have the same reasons for being pleasant and unpleasant as any other bodily movements; they are agreeable when they are free and unconstrained, disagreeable when they are the reverse. The indications from our experiments are that the only elements in articulate sounds that do not derive their pleasant or unpleasant character from association, either with meanings or with kinaesthesia, are the vowel sounds.